Management of Infectious Diseases in Fasting Patients During Ramadan

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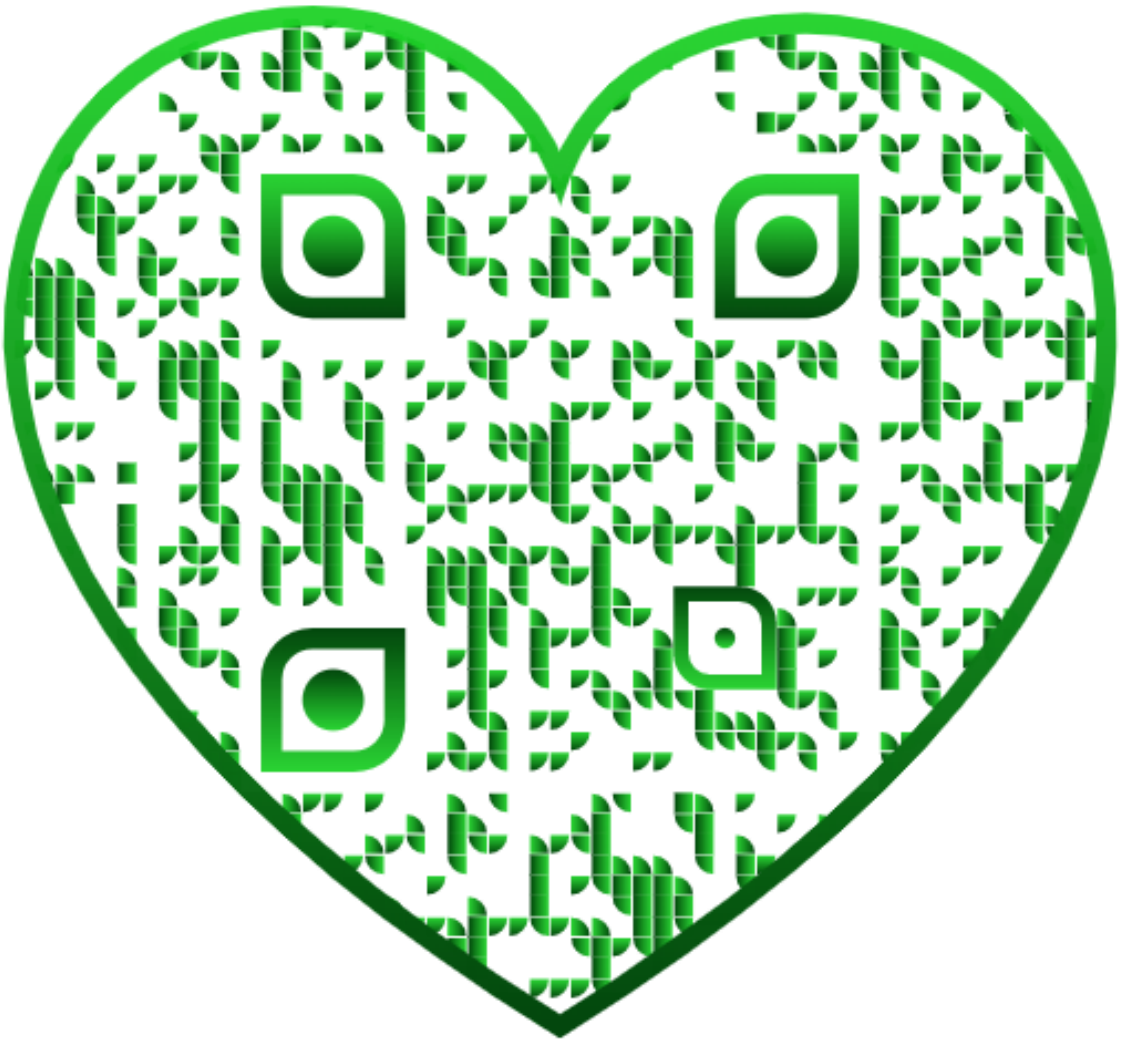
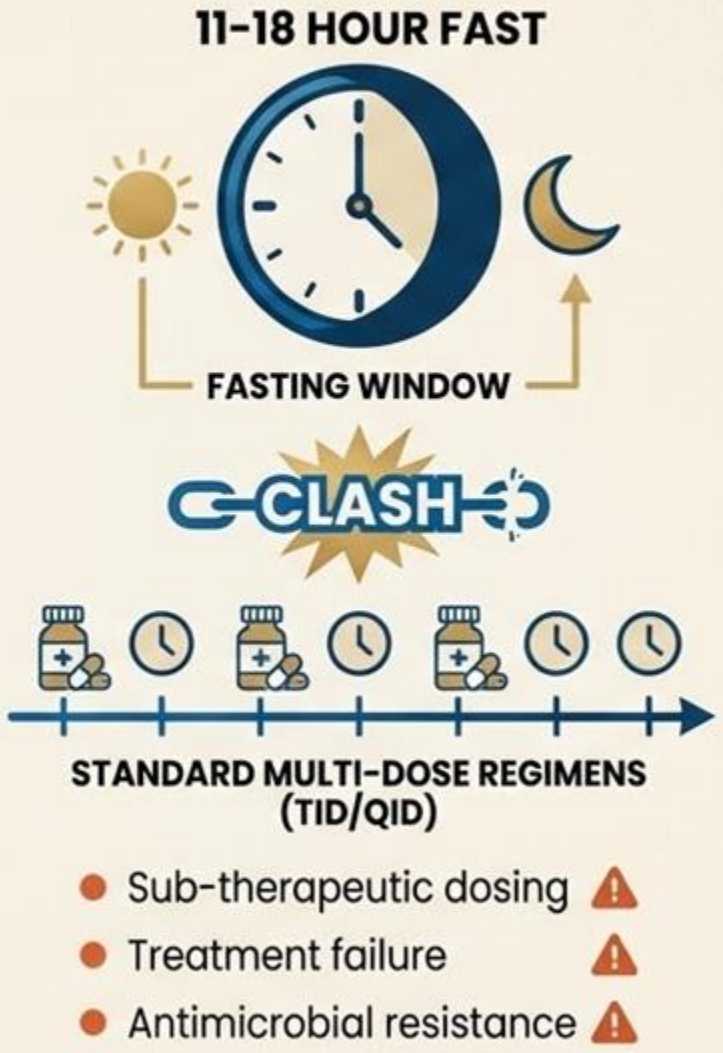


Executive Summary

THE GLOBAL CHALLENGE:
Managing acute infections for over **1.9 BILLION** Muslims observing Ramadan globally.



THE GOAL: Balance Antimicrobial Stewardship with Patient Autonomy through evidence-based dosing strategies.

Physiological Basis of Fasting

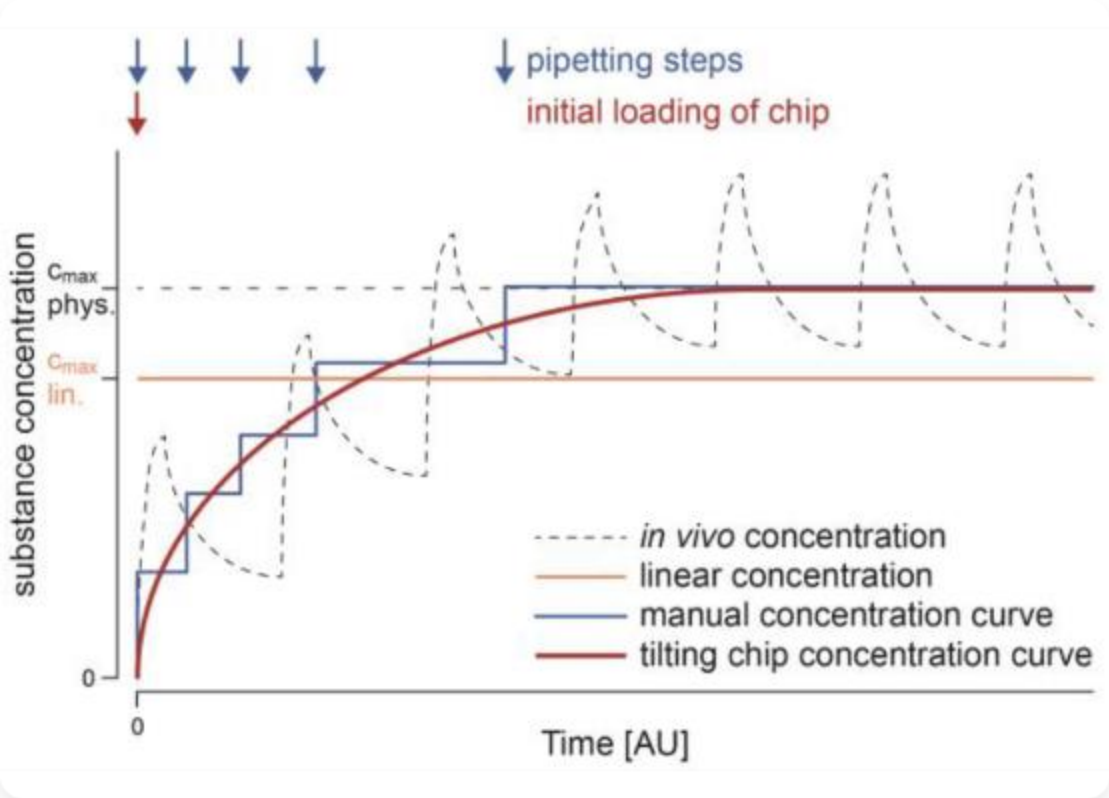
Shift in Circadian Rhythm

Pharmacokinetic (PK) & Pharmacodynamic (PD) Shifts

Fasting is not starvation; it is a shift in nutritional timing and fluid restriction.

- **Nutrition:** Two main meals (Suhoor & Iftar).
- **Hydration:** Complete restriction during daylight.
- **Metabolism:** Altered enzymatic activity and clearance rates.

PK/PD: The Asymmetric Dosing Window



Temporal Compression

- Standard **BID (q12h)** becomes **Asymmetric (9h / 15h).**
- **Time-Dependent Killing:** (e.g., Beta-Lactams) Risk of sub-therapeutic troughs during the long 15h fasting window.
- **Concentration-Dependent Killing:** (e.g., Fluoroquinolones) More resilient if total daily dose is sufficient.

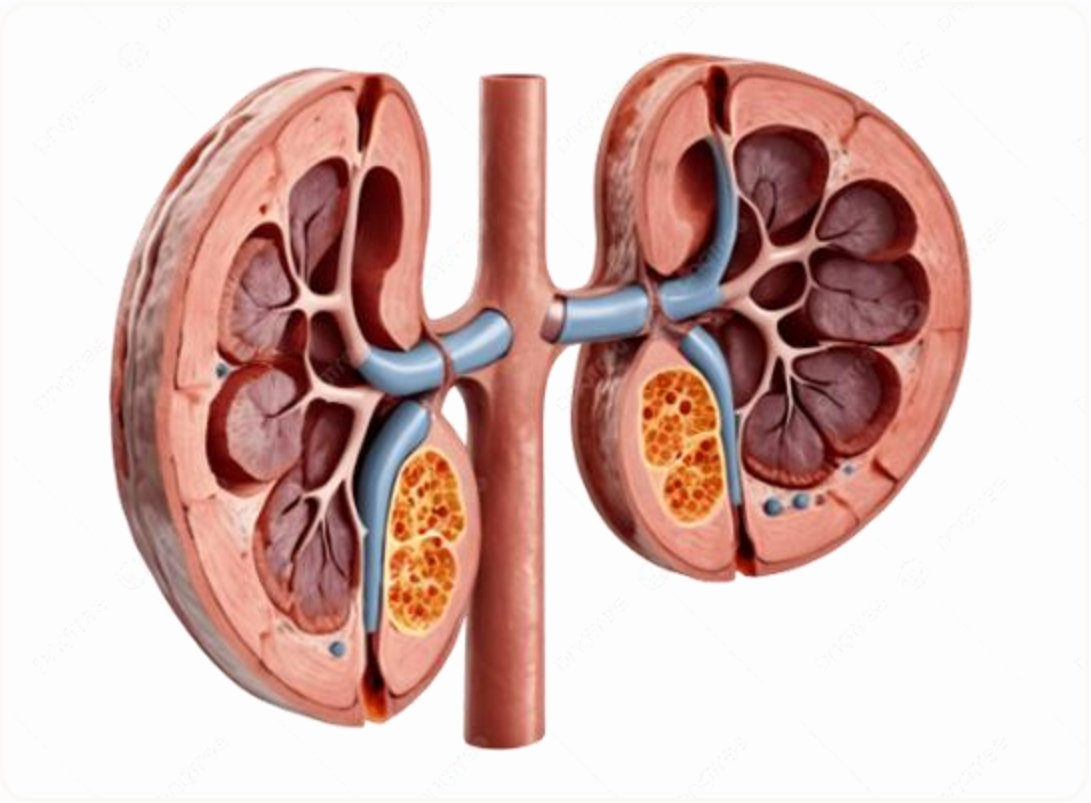
Goal: Select agents with long t1/2 > 8-10 hours.

Renal Physiology & Dehydration

The "Hypohydration" State

Fluid restriction triggers physiological conservation mechanisms:

1. **Volume Contraction:** Intravascular volume decreases.
2. **RAAS Activation:** Renin-Angiotensin system activates to retain water.
3. **Urine Concentration:** High specific gravity and osmolality.



Pharmacokinetic Impact on Kidneys

Crystalluria Risk

Reduced urine flow increases risk of drug crystallization.

Sulfonamides (Bactrim)
Acyclovir

Clearance Changes

Transient GFR reduction may extend half-life (t1/2) of renally cleared drugs.

Guidance: Avoid nephrotoxic agents (e.g., Aminoglycosides) in outpatient settings.

Gastric Physiology

1. Gastric Acidity

Hypersecretion of acid occurs just before Iftar.

Risk: Acid-labile drugs (e.g., Penicillin V, Erythromycin) may degrade if taken immediately at Iftar breaking.

2. Gastric Emptying

Iftar meals are often high-fat/heavy.

Result: Delayed gastric emptying → Delayed Tmax (onset of action).

Note: Understanding these physiological shifts is crucial for optimizing drug delivery during Ramadan.

Chelation Risks: The "Suhoor Danger"

Dairy Products (Calcium)

Drug-Nutrient Interaction

Suhoor meals are traditionally rich in dairy (yogurt, milk, cheese) to sustain the faster.

⚠ **Tetracyclines & Fluoroquinolones**

Bioavailability reduced by up to **50%** due to chelation.

Advice: Separate dosing by at least 2 hours.

Antimicrobial Stewardship Challenge

The Adherence Cliff

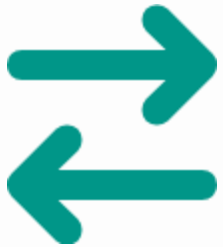
Compliance drops precipitously with frequent dosing during fasting.

TID (3x/day) & QID (4x/day): Practically impossible to adhere to without breaking fast or disrupting sleep.

Goal: Maintain efficacy while minimizing frequency.

Adherence vs. Frequency

Strategy: Pharmacokinetic Switching



The Switch Concept

Proactively switch from short half-life agents requiring frequent dosing to pharmacokinetically equivalent agents with longer half-lives.

Example:

Penicillin V (QID)

Amoxicillin (OD or BID)

Ideal Dosing Windows

WARNING: Never crush Extended-Release (ER/XL) tablets!

PK/PD Principles Refresher

Time-Dependent Killing (T>MIC)

- Efficacy depends on duration above MIC
- Examples: Beta-lactams (Penicillins, Cephalosporins), Vancomycin
- Goal: Maximize time above MIC

Concentration-Dependent Killing (Cmax/MIC)

- Efficacy driven by high peak concentration
- Examples: Aminoglycosides, Fluoroquinolones
- Goal: Achieve high Cmax

AUC-Dependent Killing (AUC/MIC)

- Efficacy related to total drug exposure over 24h
- Examples: Macrolides (Azithromycin), Tetracyclines
- Goal: Maximize AUC/MIC ratio

Understanding these principles guides optimal antibiotic selection during Ramadan fasting

The Beta-Lactam Dilemma

Standard TID Dosing Protocol

Amoxicillin 500mg every 8 hours

Mutant Selection Window

- *Drug levels fall below MIC*
- *Resistant bacteria survive & proliferate*
- *Treatment failure risk increases*

Pharmacokinetically Unsustainable

Beta-Lactam Solutions: Penicillins

Strategy: Extended-Release Formulations

Primary Recommendation:

Amoxicillin/Clavulanate XR

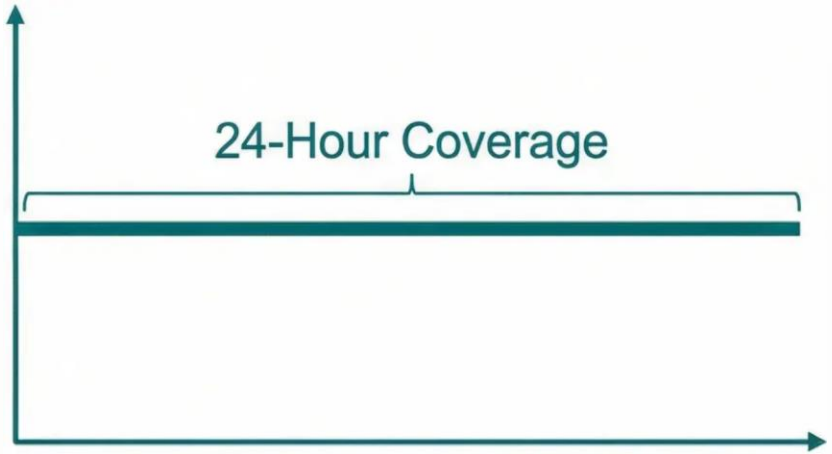
(875mg/125mg once daily)

Mechanism:

- XR formulation provides sustained release over 24 hours
- Effectively 'bridges' the Ramadan Gap
- Maintains therapeutic levels during fasting

Key Benefits:

✓ Continuous drug concentrations above MIC
✓ Maintains bactericidal efficacy
✓ Prevents resistance development



Cephalosporins Hierarchy

AVOID

Cephalexin
- Half-life: ~ 1.5 hours
- Requires TID dosing
- Incompatible with 14+ hour fasting intervals
- Creates " Ramadan Gap"

PREFER

Cefdinir
- Half-life: ~2-3 hours
- Once daily (OD) or twice daily (BID)
- Suitable for Suhoor/Iftar schedule

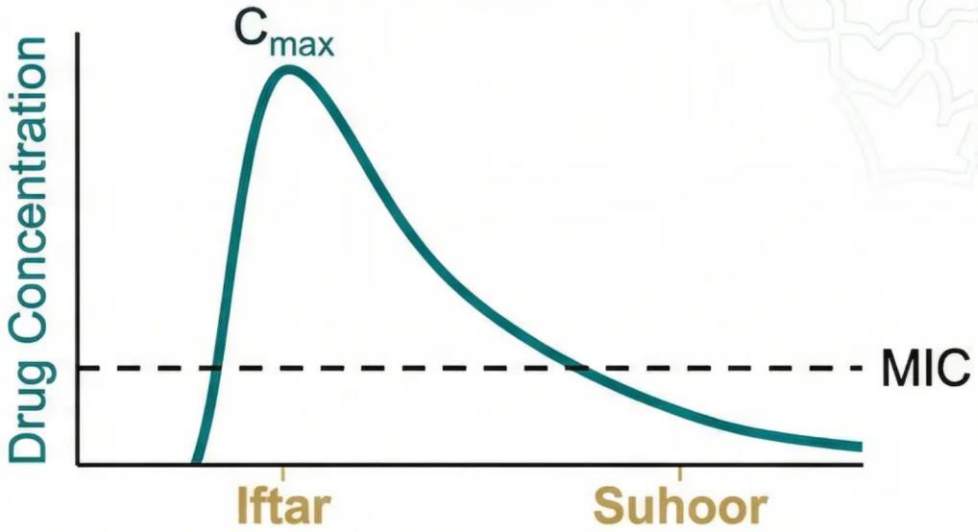
Cefadroxil XR
- Extended-release formulation
- Allows once-daily (OD) dosing
- Ideal for Ramadan compliance

Key Principle: Choose longer half-life agents that align with the fasting schedule

Concentration-Dependent Killers

Ideal for Ramadan

- Efficacy driven by Cmax/MIC ratio
- High peak concentration = maximal killing
- Single high-dose at Iftar achieves target



Aminoglycosides	Fluoroquinolones
• Gentamicin	• Ciprofloxacin • Levofloxacin

Clinical Advantage: Once-Daily (OD) dosing perfectly aligned with non-fasting window

The Post-Antibiotic Effect (PAE)

Definition:

Persistent suppression of bacterial growth that continues even after antibiotic concentration falls below MIC

Ramadan Advantage:

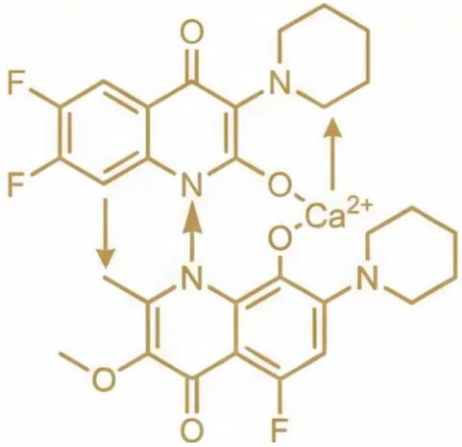
- Enables once-daily dosing
- Perfect for Iftar scheduling
- Improves patient compliance

Key for concentration-dependent antibiotics: Fluoroquinolones & Aminoglycosides

Fluoroquinolones: Ciprofloxacin Interaction

Critical Interaction Warning

- Forms insoluble chelates with Ca^{2+}, Mg^{2+}, Fe^{2+}
- Risk at Iftar: Dairy products (yogurt, cheese)
- Bioavailability reduced by up to 50%



Stewardship Solution

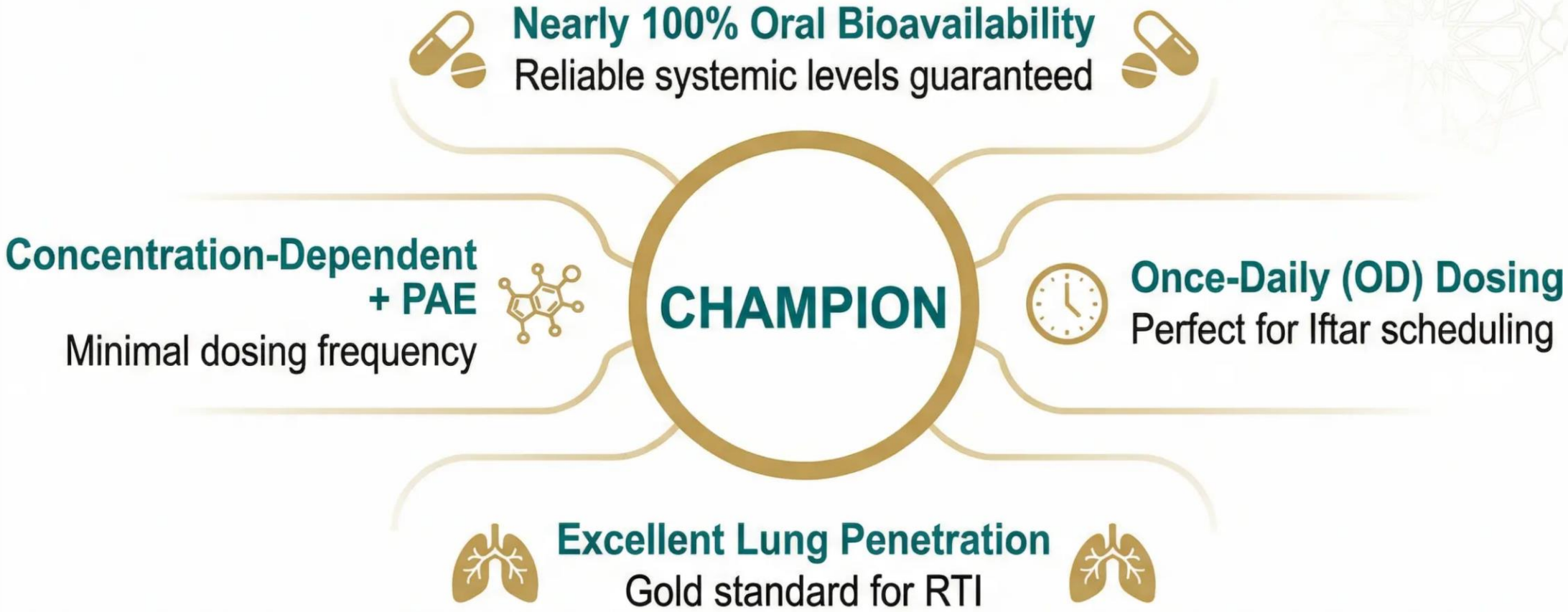
Switch to Ciprofloxacin XR 1000mg Once Daily

✓ Improved absorption characteristics

✓ Less affected by food interactions

✓ Simplified OD dosing for Ramadan

Levofloxacin: The Stewardship Champion



Conclusion: Most suitable fluoroquinolone for antimicrobial stewardship during Ramadan

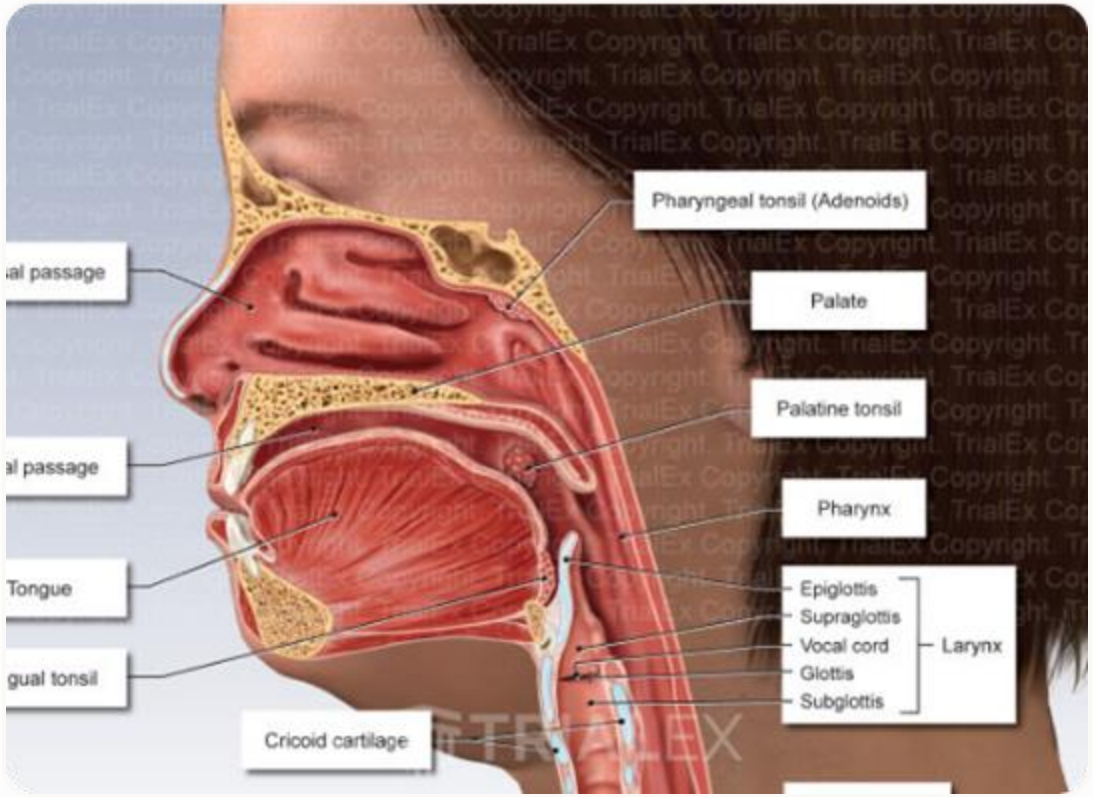
Disease 1: Acute Pharyngotonsillitis

The Challenge

Standard Care: Penicillin V 500mg QID.

Fasting Barrier:

- QID dosing impossible.
- Requires empty stomach (difficult at Iftar).
- Short half-life (30-45 mins).



Pharyngitis: Ramadan Regimens

First Line

Amoxicillin

1000 mg Once Daily

Superior PK allows OD dosing with equal efficacy.

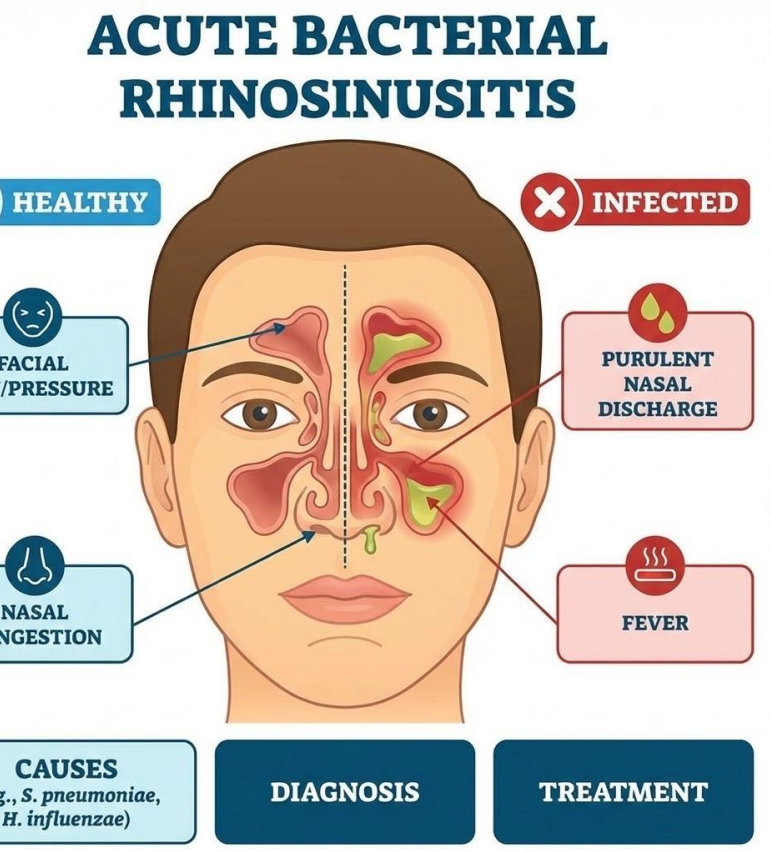
PCN Allergy

Cefadroxil

1000 mg Once Daily

Longer half-life than Cephalexin.

Disease 2: Acute Bacterial Rhinosinusitis



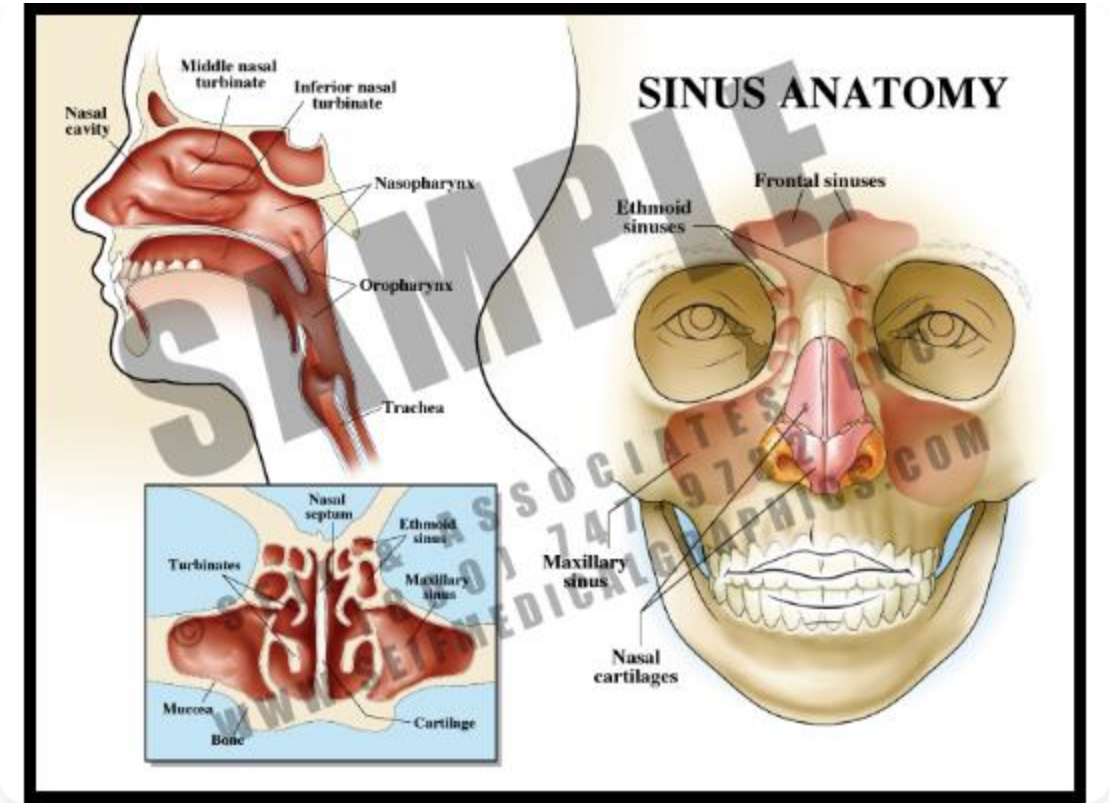
The Challenge

Standard Care: Amoxicillin-Clavulanate TID.

Fasting Barrier:

- TID dosing.
- GI side effects (Diarrhea) worsen dehydration.

Acute Bacterial Rhinosinusitis



Pharmacotherapy

First Line: Amoxicillin-Clavulanate (Augmentin)

875mg/125mg BID

Clinical Pearl: Take **with food** (Start of Iftar, End of Suhoor) to minimize diarrhea, which can be dangerous in fasting (dehydration).

Alt: Doxycycline 100mg BID.

ABRS: Ramadan Regimens

Preferred First Line

Amoxicillin-Clavulanate (High Dose)

875/125 mg Twice Daily

Take at start of Iftar/Suhoor meal to reduce diarrhea.

Alternative (Allergy)

Levofloxacin

500-750 mg Once Daily

🚫 No Dairy at same time!

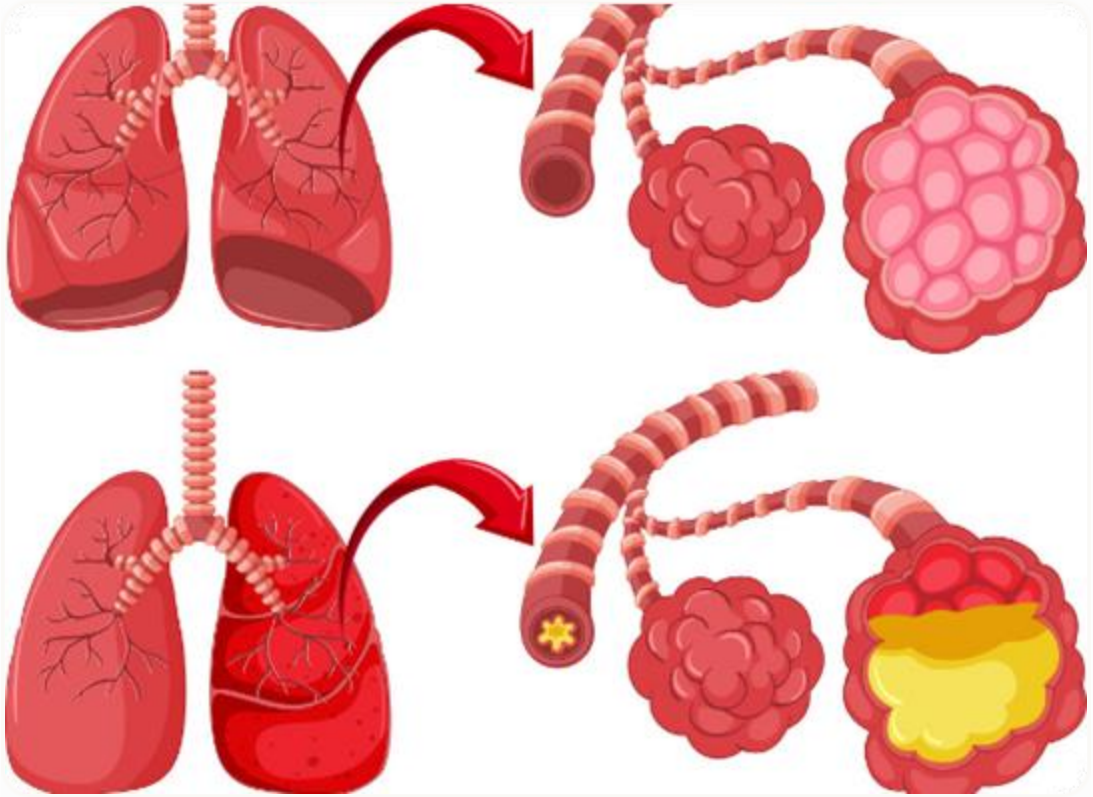
Disease 3: Community-Acquired Pneumonia

High Risk Condition

CAP carries mortality risk. High metabolic demand.

⚠ **Risk Classification:** Often Amber or Red.

Red Flags: CURB-65 > 1, Hypoxia, Confusion.



CAP: Ramadan Regimens (Low Risk)

Healthy Adults

Amoxicillin 1g BID

+

Azithromycin 500mg OD

Comorbidities

Levofloxacin 750mg OD

OR

Moxifloxacin 400mg OD

Reduces pill burden for elderly.

Warning: Calcium Chelation

The Mechanism

Doxycycline and **Fluoroquinolones** bind to Calcium/Magnesium/Iron.

Reduces bioavailability by up to **50%**.

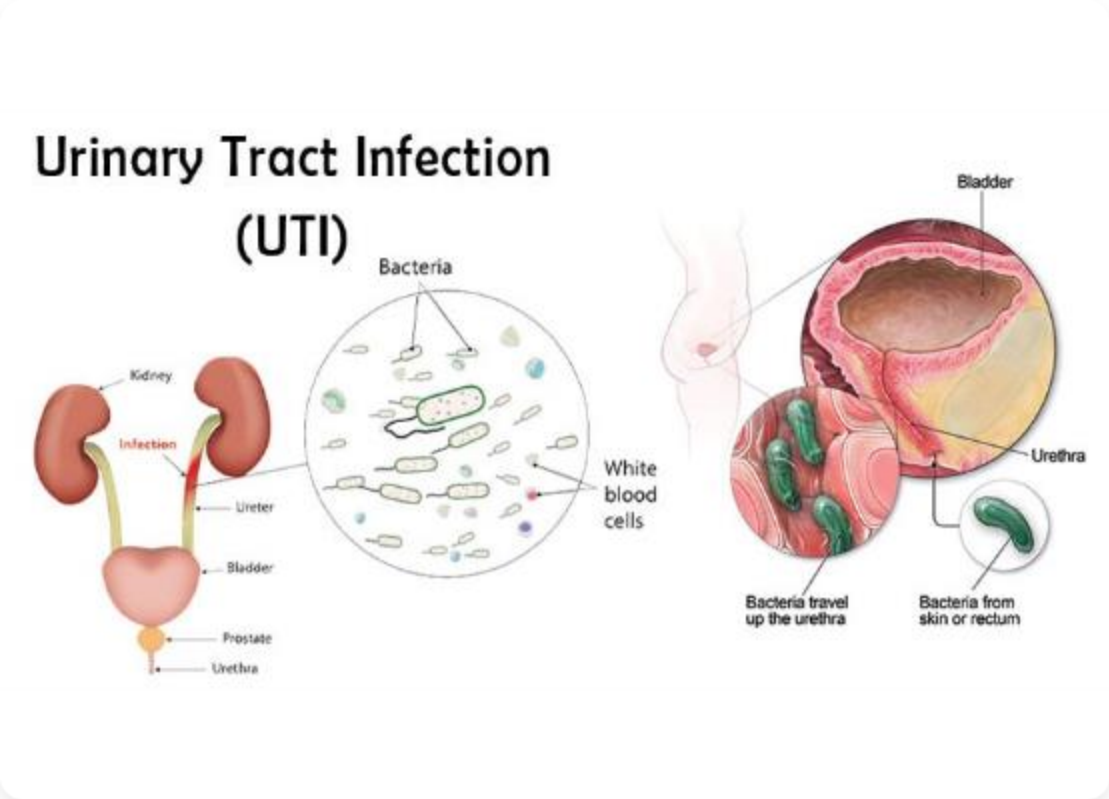
Common Suhoor Culprits

- Yogurt / Laban
- Cheese
- Antacids
- Iron Supplements

RECOMMENDATION

Take antibiotic at Iftar (if dairy-free) or **2 hours before/after** dairy intake.

UTI: Pathophysiology & Risks

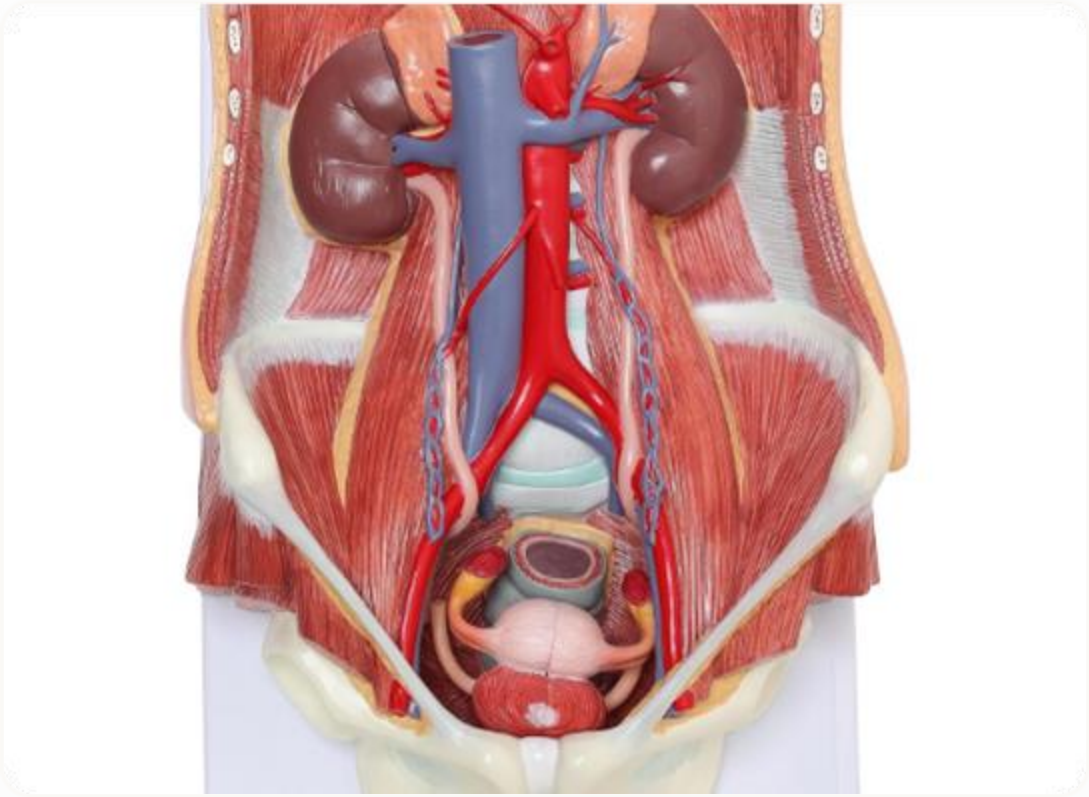


Ramadan Exacerbation

- **Urinary Stasis:** Reduced fluid intake decreases mechanical "washout" of bacteria.
- **Concentrated Urine:** Increases local irritation and symptoms (dysuria).
- **Crystalluria Risk:** Dehydration increases risk of crystal formation with certain meds (e.g., Sulfonamides).

MOST COMMON COMPLAINT

Uncomplicated Cystitis (UTI)



Dehydration Trigger

Fasting concentrates urine, promoting bacterial growth.

Standard Care Issues:

- Nitrofurantoin QID (Old dosing).
- TMP-SMX (Bactrim) requires high water intake to prevent stones.

UTI: The Gold Standard

Fosfomycin Tromethamine

3 grams Single Sachet

- **Dosing:** One dose at Iftar.
- **Adherence:** 100% Guaranteed.
- **Efficacy:** Therapeutic levels for 48-72 hrs.

UTI Pharmacotherapy Protocol

1st Line: Fosfomycin

3g

Single Oral Dose

Taken at Iftar or

RAMADAN CHAMPION

Maintains urinary conc. > 48hrs.

Alternative: Nitrofurantoin

100mg BID

Macrobid Only

Take at Iftar & Suhoor with

FOOD ENHANCES ABSORPTION

Avoid Macrodantin (QID)

Acute Gastroenteritis

The Fast Breaker

Most common cause of broken fasts.

Vomiting: Invalidates fast.

Diarrhea: Severe fluid loss.

Gastroenteritis Management

The Decision

Break Fast If:

- Active vomiting.
- > 3 loose stools / 24 hrs.
- Signs of orthostatic hypotension.

Therapeutics

Antiemetic: NauFree patches

Ondansetron 4mg OD.

Antibiotic (Dysentery): Azithromycin 500mg OD.

Diet: Avoid oily/spicy Iftar foods.

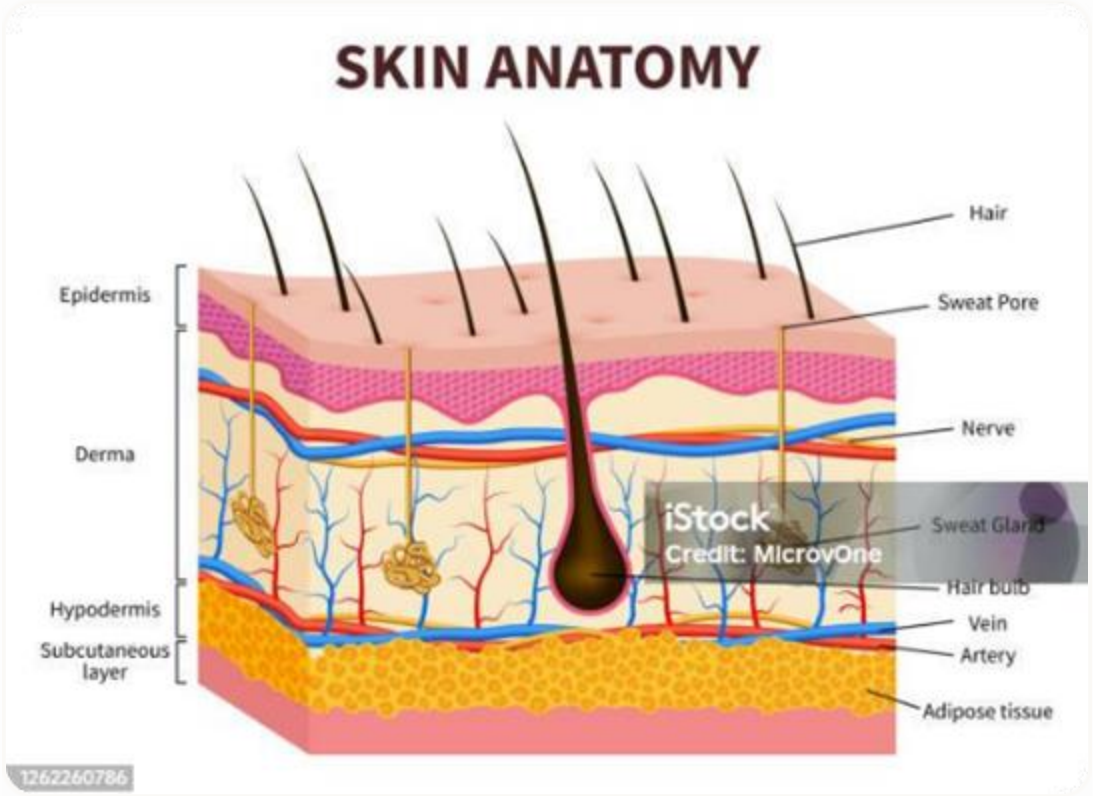
Gastroenteritis (Infectious Diarrhea)

- **Major Risk:** Rapid dehydration & electrolyte imbalance.
- **Antibiotics (if bacterial):**
  - **Azithromycin:** 1000mg Single Dose (Preferred).
  - **Ciprofloxacin:** 750mg OD.
- **Supportive Care:** Oral Rehydration Salts (ORS) between Iftar and Suhoor.

BREAK FAST CRITERION

>6 watery stools/24h or Orthostatic Hypotension.

Disease : Skin & Soft Tissue (SSTI)



Adherence Failure

Standard Care: Cephalexin 500mg QID.

Result: Missed doses lead to treatment failure and abscess formation.

Goal: Switch to agents covering MSSA/Strep with long half-lives.

SSTI: Ramadan Regimens

Non-Purulent (Cellulitis)

Cefadroxil

1 gram Once Daily

Superior PK allows OD dosing.

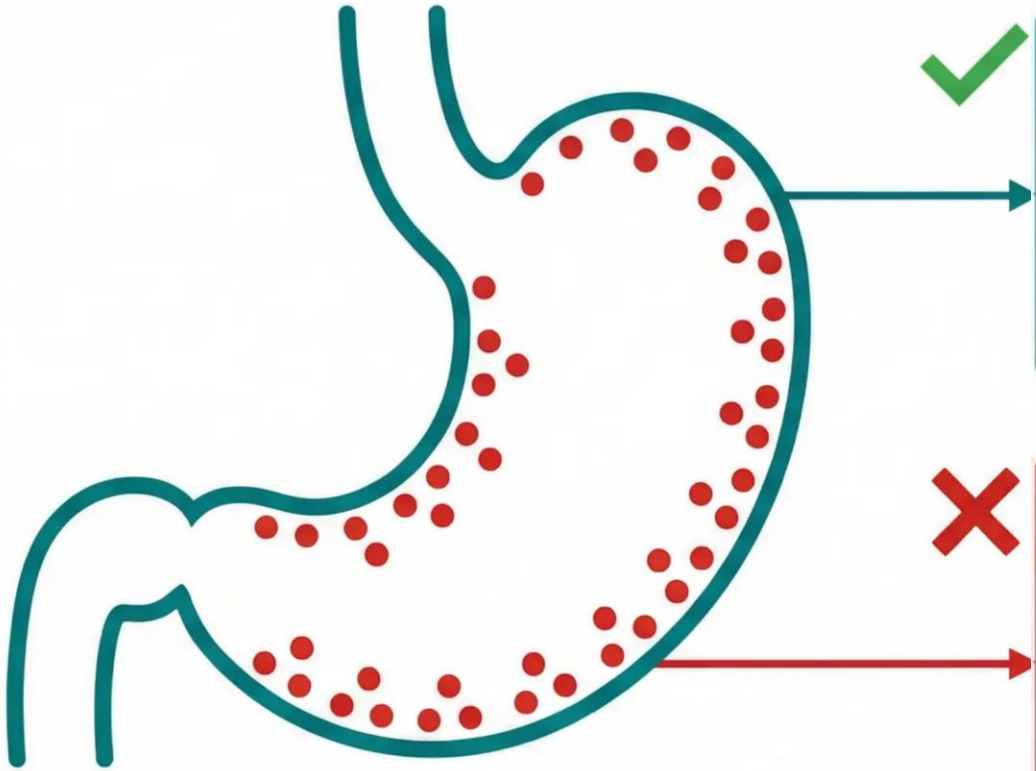
Purulent (MRSA Risk)

TMP-SMX (Bactrim) BID

OR

Doxycycline 100mg BID

H. pylori: The Acid-Pump Paradox



OPTIMAL: PPI Before Meal

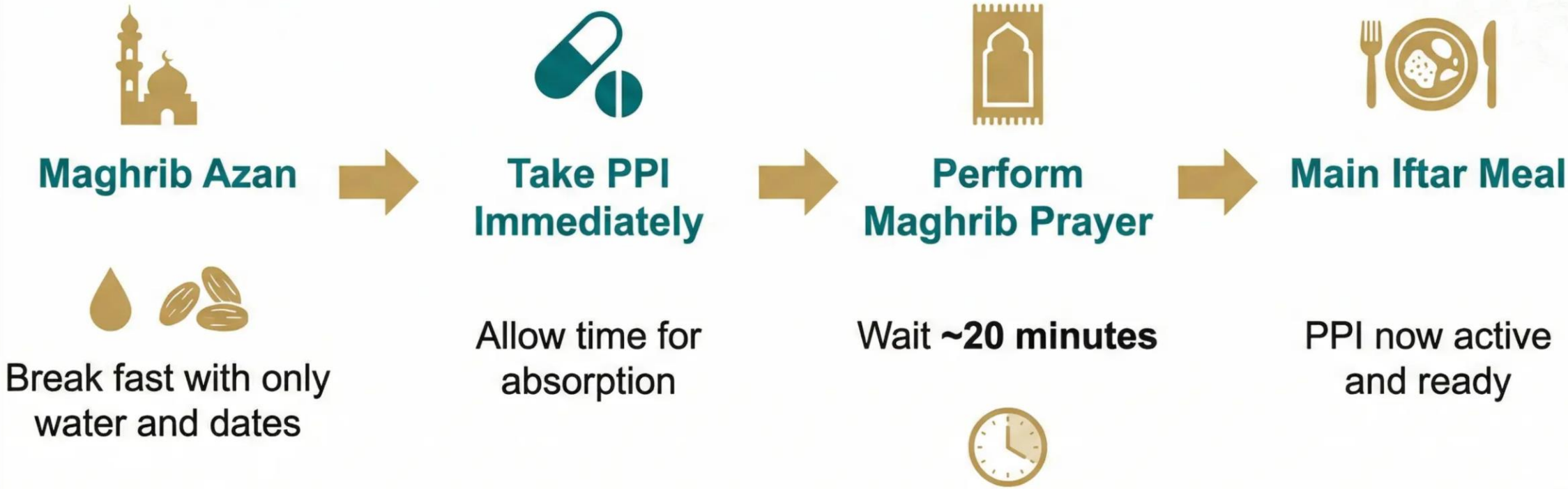
- PPI taken before proton pump activation
- Effective acid suppression achieved
- Optimal therapeutic outcome

PROBLEMATIC: PPI During Iftar

- Proton pumps already fully activated
- Reduced drug efficacy
- Suboptimal acid suppression

Risk: Treatment failure due to timing paradox

H. pylori: The 'Split Break" Protocol



Rationale: PPIs are most effective when taken BEFORE proton pump activation

H. pylori: Recommended Regimens

RECOMMENDED

Levofloxacin-based Triple Therapy

- OD/BID dosing schedule
- Compatible with Suhoor/Iftar timing
- High efficacy rates
- Excellent patient adherence

AVOID

Bismuth Quadruple Therapy

- Requires QID dosing (4x daily)
- Impossible during 14+ hour fasting
- Poor compliance expected
- Not viable for patient-centered care

Key Message: Choose regimens that align with fasting schedules for optimal outcomes

Special Populations: Diabetes

The High Risk Patient

Infection triggers stress hyperglycemia (Cortisol/Epinephrine).

⚠ **Risk: DKA / HHS**

Dehydration from fasting accelerates this risk.

Recommendation: Usually categorized as Red Risk.

Must break fast.

Special Populations: Chronic Kidney Disease

Renal Safety

Risk of "Ramadan-induced Acute on Chronic Kidney Injury".

Adjustments:

- **Avoid:** Nitrofurantoin (Toxic/Ineffective in low GFR).
- **Adjust:** Levofloxacin, Cefadroxil.
- **Monitor:** Renal function mid-Ramadan.

Summary of Strategic Switches

Disease	Standard (Avoid)	Ramadan Friendly (Use)
Pharyngitis	Pen V (QID)	**Amoxicillin 1g OD**
Sinusitis	Amox-Clav TID	**Amox-Clav BID**
UTI	Nitrofurantoin QID	**Fosfomycin SD**
Cellulitis	Cephalexin QID	**Cefadroxil OD**
Flu	Oseltamivir BID	**Baloxavir SD**